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NASA-08365 (December 2003)  
NATIONAL AERONAUTICS NASA  
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(March 2002)  
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## SECTION 08365

### SECTIONAL OVERHEAD DOORS 12/03

\*\*\*\*\*  
NOTE: Delete, revise, or add to the text in this section to cover project requirements. Notes are for designer information and will not appear in the final project specification.  
\*\*\*\*\*

This section covers manually operated and power-operated overhead sectional doors.

Drawings must indicate door location, opening dimensions, wall thicknesses, sideroom and headroom clearances, structural framing above door tracks, jamb conditions, location and type of electrical service, and remote control stations.

\*\*\*\*\*

#### PART 1 GENERAL

##### 1.1 REFERENCES

\*\*\*\*\*  
NOTE: The following references should not be manually edited except to add new references. References not used in the text will automatically be deleted from this section of the project specification.  
\*\*\*\*\*

The publications listed below form a part of this section to the extent referenced:

AMERICAN HARDBOARD ASSOCIATION (AHA)

AHA A135.4 (1982; R 1988) Basic Hardboard

ASME INTERNATIONAL (ASME)

ASME B29.1M (1993) Precision Power Transmission Roller Chains, Attachments, and Sprockets

ASTM INTERNATIONAL (ASTM)

ASTM A 153/A 153M	(2001a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 307	(2000) Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A 36/A 36M	(2001) Standard Specification for Carbon Structural Steel
ASTM A 446/A 446M	(1993) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
ASTM A 48	(1994; Rev A) Standard Specification for Gray Iron Castings
ASTM A 492	(1995) Standard Specification for Stainless and Heat-Resisting Steel Rope Wire
ASTM A 525	(1993) Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A 525M	(1991; Rev A) Standard Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process (Metric)
ASTM A 526/A 526M	(1990) Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
ASTM A 780	(1993) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM B 86	(1995) Standard Specification for Zinc-Alloy Die Castings
ASTM C 1036	(1991) Standard Specification for Flat Glass
ASTM D 2000	(2001) Standard Classification System for Rubber Products in Automotive Applications
ASTM F 568M	(1998) Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA A156.17	(1993) American National Standard for Self Closing Hinges and Pivots
BHMA A156.2	(1989) Bored and Preassembled Locks and Latches
BHMA A156.4	(1992) American National Standards for Door Controls - Closers
BHMA A156.6	(1994) Architectural Door Trim

NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA)

NEMA MG 1	(1998) Motors and Generators
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NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 6	(1993) Enclosures for Industrial Control and Systems
NEMA ST 1	(1988) Specialty Transformers (Except General Purpose Type)

RUBBER MANUFACTURERS ASSOCIATION (RMA)

RMA IP-20	(1988) Classical V-Belts and Sheaves
RMA IP-22	(1983) Drives Using Narrow Multiple V-Belts (3V, 5V, and 8V Cross Sections)

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS MMM-A-181	(Rev D) Adhesives, Phenol, Resorcinol, or Melamine Base
FS RR-C-271	(Rev D) Chains and Attachments, Welded and Weldless
FS TT-C-490	(Rev C; Am 2) Cleaning Methods for Ferrous Surfaces and Pretreatments for Organic Coatings
FS TT-W-572	(Rev B; Am 1) Wood Preservative: Water Repellent
FS ZZ-B-190	(Rev C) Belts, V: Engine Accessory Drive

UNDERWRITERS LABORATORIES (UL)

UL 674	(1994; 3rd Ed) UL Standard for Safety Electric Motors and Generators for Use in
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Hazardous (Classified) Locations

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

WCLIB Std 17 (1991) Standard Grading Rules for West Coast Lumber

WINDOWS AND DOOR MANUFACTURERS ASSOCIATION (WDMA)

NWWDA I.S. 4 (1981) Water Repellent Preservative Treatment for Millwork

1.2 SUBMITTALS

\*\*\*\*\*

NOTE: Review submittal description (SD) definitions in Section 01330 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control. Include a columnar list of appropriate products and tests beneath each submittal description.

\*\*\*\*\*

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES in sufficient detail to show full compliance with the specification:

SD-02 Shop Drawings

Fabrication drawings shall show dimensions, location and type of jambs, molds, glazing stops and glazing for the following items:

Wood Doors, Panel Type  
Wood Doors, Flush Type  
Steel Doors

Installation drawings for the following items shall include door location and dimensions, panel arrangements and construction, vision panels, track arrangement, suspension, door operating hardware including safety accessories, electric door operator type, reduction drive, voltage characteristics, safety devices, control system, and location of remote control stations.

Wood Doors, Panel Type  
Wood Doors, Flush Type  
Steel Doors  
Vision Panels  
Pass Doors  
Weatherstripping  
Hardware  
Counterbalancing Mechanism  
Chain Hoists

#### Electric Door Operators

The following shall be submitted for electrical door operating units in accordance with the paragraph entitled, "Electrical Door Operators," of this section.

Connection Diagrams  
Schematics

#### SD-03 Product Data

Manufacturer's catalog data shall be submitted for the following items:

Wood Doors, Panel Type  
Wood Doors, Flush Type  
Steel Doors  
Vision Panels  
Pass Doors  
Weatherstripping  
Hardware  
Counterbalancing Mechanism  
Chain Hoists  
Electric Door Operators

#### SD-05 Design Data

Equipment and performance data shall be submitted for the following items in accordance the paragraph entitled, "Performance Requirements," of this section.

Wood Doors, Panel Type  
Wood Doors, Flush Type  
Steel Doors

#### SD-07 Certificates

Certificates shall be submitted for the following items showing conformance with the referenced standards contained in this section.

Wood Doors, Panel Type  
Wood Doors, Flush Type  
Steel Doors  
Vision Panels  
Pass Doors  
Weatherstripping  
Hardware  
Counterbalancing Mechanism  
Chain Hoists  
Electric Door Operators

#### SD-08 Manufacturer's Instructions

Installation instructions shall indicate the manufacturer's recommended installation instructions for the following items:

Wood Doors, Panel Type  
Wood Doors, Flush Type  
Steel Doors  
Vision Panels  
Pass Doors  
Weatherstripping  
Hardware  
Counterbalancing Mechanism  
Chain Hoists  
Electric Door Operators

Operating instructions for Overhead Door Systems Maintenance shall be submitted in accordance with paragraph entitled, "Acceptance Provisions," of this section.

Operating instructions for Electric Door Operators shall include operation and maintenance instructions.

#### SD-10 Operation and Maintenance Data

Copies of the operations and maintenance manuals for the Overhead Door System shall be submitted in accordance with the paragraph entitled, "Acceptance Provisions," of this section.

### 1.3 WARRANTY

Contractor shall furnish a written guarantee that the torsion spring and counterbalance mechanism are free from defects in material and workmanship and that they will remain so for a period of not less than [2] [10] years after completion and acceptance of the project.

\*\*\*\*\*  
**NOTE: The following paragraph must be included.**  
\*\*\*\*\*

Contractor shall warrant that, upon notification by the Government, he will immediately make good any defects in material, workmanship, and door operation within the time period covered by the guarantee at no cost to the Government.

### 1.4 DELIVERY, HANDLING, AND STORAGE

Materials shall be shipped and delivered in the manufacturer's undamaged containers and stored in a clean, dry, ventilated area.

Materials shall be handled and installed in a manner that will prevent damage.

### 1.5 FIELD MEASUREMENTS

Field measurements shall be taken prior to preparation of drawings and



fabrication.

## 1.6 PERFORMANCE REQUIREMENTS

### 1.6.1 Wind Loading

Doors shall be designed and reinforced to withstand a wind-loading pressure of at least [\_\_\_\_\_] pounds per square foot (10 psf minimum) kilogram per square meter (42 ksm minimum), with a maximum deflection of 1/120 of the opening width.

### 1.6.2 Water Leakage

Door shall show no water leakage at head, jambs, sill, or through each section when subjected to a 15-minute water hose spray test. Hose shall be held at a distance of not more than 15 feet 4600 millimeter and shall produce a circle of impact of not less than 5 feet 1525 millimeter nor more than 7 feet 2135 millimeter in diameter at a water pressure of approximately 50 pounds per square inch (psi) 345 kilopascal and a flow rate of not less than 5 gallons per minute 19 liter per minute.

## PART 2 PRODUCTS

### 2.1 WOOD DOORS, PANEL TYPE

\*\*\*\*\*  
**NOTE: Delete the paragraph heading and the  
following paragraphs if flush wood or steel doors  
are required.**  
\*\*\*\*\*

[Doors shall be panel design, pressure preservative treated, and factory primed, complete with wood jamb and head molds, glazing stops, and glazing as indicated.

Stiles and rails shall be clear, straight, vertical grain Douglas fir, West Coast hemlock, or Sitka spruce, B and better, V.G. finish, graded in accordance with WCLIB Std 17, 1-3/4 inches 45 millimeter thick, surfaced four sides, and molded to receive panels and glazing. Meeting rails shall have rabbeted weather joints. Top and bottom rails and end stiles shall be 5-1/4 inches 133 millimeter minimum in width and intermediate stiles 2-5/8 inches 67 millimeter in width. Each center rail shall be 2-1/2 inches 65 millimeter minimum in width with an overall width of 5 inches 127 millimeter minimum per pair. Finger-jointed members shall not be used for doors 16 feet 4880 millimeter or less in width.

Panel inserts shall be 1/4-inch 6 millimeter tempered hardboard conforming to AHA A135.4, smooth both sides.

Construction shall be mortise and tenon with waterproof adhesive and steel dowels; or rabbeted, doweled, steel-pinned, and glued with waterproof adhesive.

Door sections shall receive a 3-minute immersion water-repellent and toxic

treatment in accordance with NWWDA I.S. 4. Materials and tests shall be in accordance with FS TT-W-572. Moisture content of wood members shall not exceed 15 percent at the time of treatment.

Each section of door 12 feet 3660 millimeter and wider shall be reinforced with continuous horizontal and diagonal reinforcing as required by the door width to meet the indicated wind loading. Reinforcing members shall be galvanized steel bars, struts, trusses, or strip steel formed to the required depth and bolted to the section frame.

Molds shall be clear, all heartwood redwood or cedar, 1- by 3-inches 25 by 80 millimeter nominal dimension, profile as indicated.

Finish shall be one coat of alkyd base exterior primer applied to a minimum dry-film thickness of 1 mil. 0.025 millimeter. Finish painting shall be in accordance with Section 09920 ARCHITECTURAL PAINTING.

Finished assembly shall be rigid and free of warp, twist or deformation, with permanently flat surfaces, free of delamination, swelling, cracking, and opening of joints. Joints shall be straight, tight, hairline joints not varying more than 1/64 inch 0.4 millimeter in opening width or in alignment. Edges shall be rounded to a 1/32-inch 0.79 millimeter minimum radius.]

## 2.2 WOOD DOORS, FLUSH TYPE

\*\*\*\*\*  
**NOTE: Delete the paragraph heading and the  
following paragraphs if wood panel type or steel  
doors are required.**  
\*\*\*\*\*

[Doors shall be flush with hardboard facing on both sides, 1-3/4 inches 44 millimeter thick, pressure preservative treated and factory prime painted, complete with wood jamb and head molds, glazing stops, and glazing as indicated.

Stiles and rails shall be clear, straight vertical grain Douglas fir, West Coast hemlock, or Sitka spruce, 1-1/2 inches 40 millimeter thick, surfaced four sides. Meeting rails shall have rabbeted weather joints. Top and bottom rails shall be 5-1/4 inches 133 millimeter wide, minimum. End stiles and frames for glazing shall be at least 2-1/2 inches 65 millimeter wide. Each intermediate rail shall be 2-1/2 inches 65 millimeter wide minimum with an overall width of 5 inches 127 millimeter minimum per pair. Wood blocking shall be provided to receive hardware and shall be doweled and glued in place.

Core shall be phenolic resin-impregnated wood fiber honeycomb, bonded to the hardboard facing with a melamine phenolic resin or resorcinol resin waterproof adhesive conforming to FS MMM-A-181.

Facing shall be 1/8-inch 3 millimeter tempered hardboard conforming to AHA A135.4, smooth one side, with a maximum water absorption of 10 percent and maximum thickness swelling of 5 percent when tested in accordance with AHA

A135.4.

Sections shall be mortise and tenon construction, doweled, and glued with waterproof adhesive; or rabbeted construction, doweled and steel pinned, and glued with waterproof adhesive.

Doors shall receive a 3-minute immersion water-repellent and toxic treatment in accordance with NWWDA I.S. 4. Materials and test shall be in accordance with FS TT-W-572. Moisture content of wood members of door sections shall not exceed 15 percent at the time of the treatment.

Each section of the door shall have continuous horizontal and diagonal reinforcing as required by the door width to meet the indicated wind loading. Reinforcing members shall be galvanized steel bars, struts, trusses, or strip steel formed to the required depth and bolted to the section frame.

Molds shall be clear, all heartwood redwood or cedar, 1- by 3-inches 25 by 80 millimeter nominal dimension, profile as indicated.

Finish shall be one coat of alkyd base exterior primer applied to a minimum dry film thickness of 1 mil. 0.025 millimeter. Finish painting shall be in accordance with Section 09920 ARCHITECTURAL PAINTING.

Finished assembly shall be rigid and free of warp, twist or deformation, with permanently flat surfaces, free of delamination, swelling, cracking, and opening of joints. Joints shall be straight, tight, hairline joints not varying more than 1/64 inch 0.4 millimeter in opening width or in alignment. Edges shall be rounded to a 1/32-inch 0.79 millimeter minimum radius.]

## 2.3 STEEL DOORS

\*\*\*\*\*  
**NOTE: Delete the paragraph heading and the  
following paragraphs if wood doors are required.**  
\*\*\*\*\*

[Doors shall be industrial quality, sectional design, roll formed from a single steel sheet into a flush or semiflush horizontal ribbed or fluted panel. Each section shall be not more than 24 inches 610 millimeter high and not less than 2 inches 50 millimeter deep. Horizontal edges shall be rolled to a continuous shiplap weather joint with a reinforcing-flange return.

Steel sheets shall be galvanized, 20 gage 1.0 millimeter, conforming to ASTM A 446/A 446M, Grade A, or ASTM A 526/A 526M, G90, Z275, with the additional requirement of a minimum yield strength of 33,000 psi. 227 Megapascal. Sheets shall be chemically cleaned, rinsed, and given a zinc-phosphate conversion coating, rinsed with cold water, then sealed with a chromic-acid rinse in accordance with FS TT-C-490, Method III, Type I. Minimum weight of pretreatment coating shall be not less than 150 milligrams per square foot. 92903 square millimeter.

Pretreated steel sheets shall be given the manufacturer's standard prime coat of paint applied to both faces of the door after forming.

Panel ends shall be enclosed with galvanized-steel channel 2 inches 50 millimeter deep and not less than 16-gage 1.6 millimeter welded in place. Each panel shall have a 2-inch 50 millimeter deep box section, intermediate stiles cut to the profile of the panel, 16-gage 1.6 millimeter, not more than 48 inches 1220 millimeter on center and welded securely in place on the inside face of the door.

Bottom panel shall be reinforced with a continuous channel or angle conforming to the profile of the bottom panel not less than 16-gage 1.6 millimeter.

Each section of doors shall be reinforced with continuous horizontal and diagonal reinforcing as required by the door width to meet the indicated wind loading. Reinforcing members shall be galvanized steel bars, struts, trusses, or strip steel formed to the required depth and bolted or welded to the inside face of the door.

Finished doors shall be rigid, flat, and free of warp, twist, or deformation. Joints shall be straight and tight and shall not vary more than 1/64 inch 0.4 millimeter in opening width or in alignment. Exposed surfaces shall be free of visible welds, and through-bolt fasteners shall not show on the exterior surface of the door.]

## 2.4 VISION PANELS

Vision panels shall be as indicated, complete with glass, and set in neoprene or rubber channel in a 16-gage 1.6 millimeter galvanized steel frame. Glass shall be 1/8-inch 3 millimeter thick double strength clear sheet conforming to ASTM C 1036.

## 2.5 PASS DOORS

\*\*\*\*\*  
**NOTE: Drawings must indicate location, door swing,  
and glazing arrangements.**  
\*\*\*\*\*

Pass doors, where indicated, shall be complete with glazing, operating hardware, and masterkeyed locks.

Pass doors shall be constructed of the same materials and shall be the same design as overhead doors. Pass doors shall have three single-acting spring hinges, three surface mounted butt hinges, or a continuous hinge and an ANSI Type 3001 hydraulic door check.

Hinges shall conform to BHMA A156.17. Closers shall conform to BHMA A156.4. Locks shall conform to BHMA A156.2 and BHMA A156.6.

## 2.6 WEATHERSTRIPPING

Weatherstripping shall consist of an adjustable weatherstrip gasket at the

top of each door, compressible door bottom seal on the bottom horizontal edge of each door, and shall be rubber or neoprene conforming to ASTM D 2000, either 4AA615A13B13 or 3BE615A14B14.

Head gasket shall be extruded rubber, 1/8-inch 3 millimeter thick, L-shaped, fastened to the top of the door with corrosion resistant steel self-tapping screws through continuous aluminum strap at least 5/8-inch 16 millimeter wide and 1/8-inch 3 millimeter thick.

Door bottom seal shall be extruded rubber, 1/8-inch 3 millimeter thick, U-shape or tube shape, fastened to the bottom of the door with corrosion resistant steel self-tapping screws through concealed aluminum strap or aluminum extrusion.

## 2.7 HARDWARE

### 2.7.1 Track

\*\*\*\*\*  
**NOTE: Select one of the following two paragraphs  
for the size of track. Consult the manufacturer's  
printed recommendations and use tables.**  
\*\*\*\*\*

Size of the track shall be 3-inch 80 millimeter galvanized steel conforming to ASTM A 446/A 446M, Grade A, and shall be not less than 0.108 inches 2.74 millimeter uncoated thickness. Horizontal and vertical tracks shall include a continuous galvanized angle bracket not less than 3 by 2 inches by 3/16 inch 75 by 50 by 4.7 millimeter spot welded to the track. Angle brackets shall be steel conforming to ASTM A 36/A 36M, slotted for track adjustment, and galvanized in accordance with ASTM A 525, G90. ASTM A 525M, Z275. Vertical sections of track shall be slotted 2 inches 50 millimeter on center for door drop safety devices. Welds and abrasions shall be coated with a repair coating conforming to ASTM A 780.

Size of the track shall be 2-inch 50 millimeter galvanized steel conforming to ASTM A 446/A 446M, G90, Z275M, Grade A, and shall be not less than 0.0897-inch 2.278 millimeter uncoated thickness. Horizontal and vertical tracks shall include a continuous galvanized angle bracket not less than 2 by 2 inches by 3/16 inch 50 by 50 by 4.7 millimeter spot welded to the track. Angle brackets shall be steel conforming to ASTM A 36/A 36M, slotted for track adjustment, and galvanized in accordance with ASTM A 525, G90. ASTM A 525M, Z275. Vertical sections of track shall be slotted 2 inches 50 millimeter on center for door drop safety devices. Welds and abrasions shall be coated with repair coating conforming to ASTM A 780.

### 2.7.2 Track and Equipment Supports

Supports shall be fabricated into a support frame from steel shapes and plates conforming to ASTM A 36/A 36M, galvanized, conforming to ASTM A 525, G90. ASTM A 525M, Z275. Shapes and plates shall be sized in accordance with the manufacturer's standard practices for the size, weight, and type of door installation, except that angle shapes shall be at least 1-1/4 by 1-1/4 inches by 1/8 inch. 32 by 32 by 3 millimeter.

### 2.7.3 Threaded Fasteners

Unfinished steel bolts and nuts conforming to ASTM A 307, Grade A, ASTM F 568M, galvanized in accordance with ASTM A 153/A 153M, Table 1, shall be used as required.

### 2.7.4 Rollers

\*\*\*\*\*  
**NOTE: Select the roller size in accordance with the track selected and whether the requirement demands a spark-free type for installation in hazardous atmospheres. Delete the inapplicable paragraph.**  
\*\*\*\*\*

Rollers shall be heavy duty 3-inch 75 millimeter diameter ball bearing type with solid steel one piece tires, 10 steel ball bearings 5/16-inch 7.94 millimeter in diameter in case-hardened races, and mounted on a roller shaft not less than 7/16 inch 11.11 millimeter in diameter.

Rollers shall be heavy duty 2-inch 50 millimeter diameter ball-bearing type with solid steel one piece tires, 12 steel ball bearings 1/4 inch 6 millimeter in diameter in case-hardened races, and mounted on a roller shaft not less than 7/16 inch 11.11 millimeter in diameter.

\*\*\*\*\*  
**NOTE: Select one of the following roller sizes if a roller for hazardous atmospheres is required.**  
  
**Delete both paragraphs if not required.**  
\*\*\*\*\*

Rollers shall be heavy duty 3-inch 80 millimeter diameter ball bearing type, with solid one piece neoprene or bronze tires, 10 steel ball bearings 5/16-inch 7.94 millimeter in diameter in case-hardened races, and mounted on a roller shaft not less than 7/16 inch 11.11 millimeter in diameter.

Rollers shall be heavy duty 2-inch 50 millimeter diameter ball bearing type, with solid, one piece neoprene or bronze tires, 12 steel ball bearings 1/4 inch 6 millimeter in diameter in case-hardened races, and mounted on a roller shaft not less than 7/16 inch 11.11 millimeter in diameter.

### 2.7.5 Hinges

Hinges shall be heavy wrought steel, galvanized, not less than 0.0897 inches 2.278 millimeter uncoated thickness, US 2H finish, surface mounted, solid steel hinge pin, and shall conform to BHMA A156.17. Galvanizing shall conform to ASTM A 153/A 153M, Table 1.

Hinges shall be installed at each door section at a maximum of 48 inches 1220 millimeter on center. Double-end hinges shall be applied to door sections over 20 feet 6100 millimeter in width. Hinges shall be bolted

through stiles and rails and integrated with horizontal reinforcement bars.

#### 2.7.6 Pull Handles, Locks, and Latches

Manually operated push-up doors shall have galvanized steel lifting handles on each side of the door and five-pin cylinder locks and locking devices keyed as directed, by the Contracting Officer.

Locking assembly shall have a keyed cylinder lock, spring-loaded deadbolt, chrome operating handle, cam plate, and lock bars with adjustable guides to engage through slots in the track.

\*\*\*\*\*  
**NOTE: Select one of the following two paragraphs as  
required for masterkeying.**  
\*\*\*\*\*

[Doors shall have the manufacturer's standard five-pin tumbler locks, keyed as directed by the Contracting Officer.]

[Doors shall have six-pin tumbler locks with temporary construction cores which shall be removed when directed by the Contracting Officer. Security cores will be installed by the Government.]

#### 2.8 COUNTERBALANCING MECHANISM

Doors shall be counterbalanced by adjustable tension tempered steel torsion springs mounted on hardened steel shafts and connected to the specified lift cable. Required lift or pull for manual operation shall not exceed 25 pounds. 111 newton. Required pull on chain hoist geared operators shall not exceed 35 pounds. 155 newton.

Torsion springs shall be weight rated and shall provide the specified number of door cycle operations.

Counterbalance shafts shall be solid case-hardened steel at least 1 inch 25 millimeter in diameter and keyed at each end to receive cable drums.

Cable drums shall be cast aluminum or gray iron castings conforming to ASTM A 48, grooved to receive wire cable, and provided with keyways and setscrews to provide positive attachment to the counterbalance shaft. Flat, nontapered cable drums on low lift doors, spirally tapered cable drums on vertical lift doors, and combination spirally tapered and flat drums on high lift doors shall be provided.

Mounting brackets shall be the manufacturer's standard ball bearing brackets, one at each end of shaft, with one additional bracket for each spring in the center to support shafts up to 16 feet 4880 millimeter long, or two additional brackets mounted at 1/3 points to support shafts over 16 feet 4880 millimeter long.

Lift cables shall be improved galvanized plow steel wire, at least 6 by 19 strand, fiber core, conforming to ASTM A 492, with a minimum design factor of 10 times the weight of the door.

Safety devices shall be spring loaded steel or bronze, cam-mounted on the bottom door roller assembly on each side, and designed to stop the door automatically if either cable breaks.

Door bumpers shall be compression spring or leaf spring, installed at the end of each horizontal track, and located to provide the proper cushioning of the door at the end of the opening operation.

## 2.9 CHAIN HOISTS

\*\*\*\*\*

NOTE: Delete the paragraph heading and the following paragraphs if not required.

Direct drive is generally recommended for use on doors over 13 feet 3960 millimeter high but not exceeding 12 feet 3660 millimeter wide or 168 square feet 1506 square meter.

Side-mounted 3-to-1 gear reduction drive chain hoists are generally recommended for use on doors not exceeding 22 feet 6700 millimeter wide or 308 square feet 28.61 square meter.

Trolley drive chain hoists are recommended for doors over 15 feet 4570 millimeter high, and when the door area exceeds 195 square feet 18.1 square meter.

Consult the manufacturer's literature and technical data for particular applications.

Drawings must indicate location (left or right hand) of chain hoists and door clearances. Select the type of chain hoist required. Delete inapplicable paragraphs.

\*\*\*\*\*

### 2.9.1 Type of Driver

[Direct drive chain hoists shall be side mounted, manually operated, with endless cadmium plated alloy steel hand chain, cast iron pocket pulleys, and chain guards mounted on counterbalance shafts. Required pull for operation shall not exceed 35 pounds 155 newton.]

[Reduction drive chain hoists shall be side mounted, manually operated, with endless cadmium plated alloy steel hand chain, chain pocket wheel, and a reduction unit of at least 3 to 1, with roller chain and sprocket drive end-mounted on the counterbalance shaft. Required pull for operation shall not exceed 35 pounds 155 newton.]

[Trolley mounted drive chain hoists shall be the manually operated reduction-drive type with endless cadmium plated alloy steel hand chain, chain pocket wheels and guards, reduction units of at least 3 to 1, driving



through separate drive shafts to the center trolley tracks, and connected to doors through secondary drive roller chains and sprockets. Yield strength of the chain shall be at least three times the required pull of the total door weight. Required pull for operation shall not exceed 35 pounds. 155 newton.]

#### 2.9.2 Hand Chain and Chain Drives

Hand chain shall be cadmium plated alloy steel conforming to FS RR-C-271, Type I, Grade C, Class 1. Yield strength shall be at least three times required pull of the total door weight.

Chain pocket pulleys shall be cast iron conforming to ASTM A 48 ASTM A 48.

Roller chains shall be power transmission series steel roller chain conforming to ASME B29.1M and shall have a minimum safety factor of 10 times the design load.

Roller chain side bars, rollers, pins, and bushings shall be heat treated or otherwise hardened steel.

Chain sprockets shall be high carbon steel with machine cut hardened teeth and machine bored center with keyway and setscrew.

#### 2.10 ELECTRIC DOOR OPERATORS

\*\*\*\*\*

**NOTE: Delete the paragraph heading and the following paragraphs if not required.**

**Drawings must indicate voltage and phase characteristics, locations of remote control stations, and required clearance dimensions.**

**Refer to Division 16, "Electrical," for electrical requirements.**

\*\*\*\*\*

Connection Diagrams for electrical door operating units shall show complete wiring details.

Schematics shall indicate amperage and voltage characteristics for wiring systems.

##### 2.10.1 General

Electrical wiring shall conform to the applicable requirements of Section 16145 STANDARD WIRING SYSTEMS.

Door operator controls shall conform to the applicable requirements of Section 16286 OVERCURRENT PROTECTIVE DEVICES.

Operator assembly shall be the size and capacity recommended and provided by the door manufacturer for the specified door. Assembly shall be

complete with an electric motor and factory prewired motor controls, gear-reduction unit, solenoid operated brake, clutch, remote control stations, manual or automatic control devices, all conduit and wiring from motor to controls and to control stations, and accessories as required for the proper operation of the door.

Operator shall be designed so that the motor may be removed without disturbing the limit switch adjustment and without affecting the emergency auxiliary operator.

A manual crank gear or chain gear operator with a release clutch shall be provided on doors over 300 square feet 27.87 square meter in area to permit manual door operation in case of power failure. Manual operator shall be arranged so that it may be put into and out of operation from the floor and its use shall not affect the adjustment of the limit switches. An electrical or mechanical device shall be provided that will automatically disconnect the motor from the operating mechanism when the manual operating mechanism is engaged.

#### 2.10.2 Type

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NOTE: Select the type operator required. Consult the manufacturer's literature and technical data for special conditions and applications.

Trolley (or drawbar) type is suitable for standard lift sectional door sizes up to approximately 400 square feet 37.16 square meter. Note that the trolley type is usually mounted above and to the rear of the horizontal door track, and the unit may cause interference with other equipment or with building structure.

Sidemount, centermount, or jackshaft type of operator should be selected for vertical lift and high lift doors and for conditions where the trolley type can not be used.

Worm-gear drive should be considered for heavy duty high frequency door operation of over 200 open and close cycles per day and for doors weighing over 800 pounds 360 kilogram.

Gearhead trolley type worm-gear drive, totally enclosed, should be considered for standard lift doors of any width and height and when heavy duty high frequency use or conditions of excessive dust are anticipated.

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[Electric motors shall be the driven trolley or drawbar type, V-belt, roller chain and sprocket primary drive, and roller chain and sprocket secondary drive. Motor, clutch, and drive assembly shall be the horsepower

rating in watts and design determined by the door manufacturer for the size and weight of the door and as specified herein.]

[Electric motors shall be the driven gear reduction trolley type, with worm and worm-gear reduction enclosed running-in-oil, primary drive and chain or worm-gear secondary drive, quick clutch disconnect release for manual operation. Motor, clutch, and drive assembly shall be the horsepower power rating in watts and design determined by the door manufacturer for the size and weight of the door and as specified.]

[Electric motors shall be the driven jackshaft type, with clutch disconnect release for manual operation, V-belt, and roller chain drive connected to the counterbalance shaft. Motor, clutch, and drive assembly shall be the horsepower rating in watts and design determined by the door manufacturer for the size and weight of the door and as specified.]

[Electric motors shall be the driven side mount or center mount type, with V-belt and roller chain drive connected to the counterbalance shaft and with auxiliary chain hoist and disconnect clutch. Motor, clutch, and drive assembly shall be the horsepower rating in watts and design determined by the door manufacturer for the size and weight of the door and as specified.]

[Electric motors shall be the driven side-mount or center mount gearhoist type, worm and gear reduction drive, direct coupled chain drive to the counterbalance shaft, with auxiliary chain hoist and disconnect clutch. Motor, clutch, and drive assembly shall be the horsepower rating in watts and design determined by the door manufacturer for the size and weight of the door and as specified.]

#### 2.10.3 Motors

High starting torque motors shall be reversible constant duty electric motors with overload protection. Motors shall be of sufficient torque and horsepower rating in watts to move doors in either direction from any position and shall produce a door travel speed of not less than 8 nor more than 12 inches 200 nor more than 300 millimeter per second without exceeding the horsepower rating.

Motors shall conform to NEMA MG 1 for fractional and integral horsepower wattage motors and to the requirements specified.

Fractional horsepower motors up to 1/2 horsepower 375 watt shall be the single phase, capacitor start type, designed for a minimum starting current. Single phase motor voltage shall be 115 volts, 60 hertz, or 115/230 volts, 60 hertz. A dual voltage rating may be provided at the option of the Contractor.

Motors 1/2 horsepower 375 watt and larger shall be the three phase, squirrel cage, induction type, 230 volts, 60 hertz, or 230/460 volts, 60 hertz.

Motors shall be NEMA Design B, C, or D meeting the requirements specified herein.

Motor frame sizes shall conform to NEMA MG 1. Motor enclosures shall be ferrous with cast iron end bells.

[Motors shall be the open drip proof type certified for a maximum temperature rise of 104 degrees F 40 degrees C above an ambient reference temperature of 104 degrees F 40 degrees C under continuous operation for at least 1 hour at the full nameplate power output. Motor insulation shall be Class A and service factor shall be 1.15.]

[Motors shall be the totally enclosed nonventilated type certified for a maximum temperature rise of 131 degrees F 55 degrees C above an ambient reference temperature of 104 degrees F 40 degrees C under continuous operation for at least 1 hour at full nameplate power output. Enclosure shall be fitted with a plugged drain. Motor insulation shall be Class A and service factor shall be 1.0.]

[Motors shall be the explosionproof type certified for a maximum temperature rise of 131 degrees F 55 degrees C above an ambient reference temperature of 104 degrees F 40 degrees C under continuous operation for at least 1 hour at full nameplate power output. Motor shall have an explosionproof brake. Insulation shall be Class A and service factor shall be 1.0. Enclosure shall be fitted with a UL approved drain and breather and shall be certified and labeled in accordance with UL 674, Class 1, Groups C and D.]

#### 2.10.4 Motor Bearings

Motor bearings shall be bronze sleeve or heavy duty ball or roller antifriction type, with full provisions for the type of thrust imposed by the specific duty load.

Bearings in all motors less than 1/2 horsepower with a power rating of 375 watt shall be factory sealed.

Motors coupled to worm-gear reduction units shall be equipped with either ball or roller bearings.

Bearings in all motors 1/2 horsepower with a power rating of 375 watt or larger shall be equipped with lubrication fittings with provision for automatic positive relief of lubricant pressure by either built-in relief devices or automatic ball and spring relief fittings at the bottom of the bearing housing. Pressure relief shall be to the outside of the housing. Lubrication fittings shall be fitted with color-coded plastic or metal dust caps.

Bearings that are lubricated at the factory for extended duty periods shall not need to be lubricated for a given number of operating hours. An appropriate tag or label on the motor shall display this information.

#### 2.10.5 Motor Starter, Controls, and Enclosures

Each door motor shall have a factory wired, unfused, disconnect switch; a reversing, across-the-line magnetic starter with thermal overload protection; 120-volt operating coils with a control transformer limit

switch; and a safety interlock assembled in an NEMA ICS 6 type enclosure as specified herein.

Door interlocks shall be provided to prevent opening the enclosure doors when disconnect switches are in the "ON" position. Switch operating handles shall have position indications and provisions for padlocking in the "OFF" position.

Adjustable switches, electrically interlocked with motor controls and set to automatically stop the door at the fully open and fully closed positions, shall be provided.

#### 2.10.6 Control Enclosures

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**NOTE: If explosionproof enclosures are required,  
drawings must indicate the group of the enclosure.**  
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Control enclosures shall conform to NEMA ICS 6 for [general purpose, NEMA Type 1.] [oil-tight and dust-tight, NEMA Type 13.] [explosionproof, NEMA Type 7, group as indicated.] [explosionproof, NEMA Type 9, group as indicated.]

#### 2.10.7 Transformers

Starters with 230/460 to 120-volt ac control transformers with one secondary fuse shall be provided when required to reduce the voltage on control circuits to 120 volts ac or less. Transformers shall conform to NEMA ST 1.

#### 2.10.8 Safety Edge Device

Each door shall be provided with a pneumatic safety switch extending the full width of the door and located within a U-section neoprene or rubber door bottom seal mounted on the bottom rail of the bottom door section. Switch shall immediately stop and reverse the door upon contact with an obstruction in the door opening during downward travel and shall cause the door to return to the full-open position. Safety device shall not be a substitute for a limit switch.

Safety device shall be connected to the control circuit through a retracting safety cord and reel.

#### 2.10.9 Remote Control Stations

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**NOTE: Drawings must indicate the location, type,  
and number of remote control stations required for  
each door.**  
  
**Specifications must be modified if alternative types  
of door-control stations are required.**  
\*\*\*\*\*

Interior remote control stations shall be full guarded, momentary contact, three button, heavy duty, surface mounted NEMA ICS 6 type enclosures as specified. Buttons shall be marked "OPEN," "CLOSE," and "STOP." The "CLOSE" button shall be the type requiring a constant pressure to maintain the closing motion of the door. When the door is in motion and the "STOP" button is pressed, the door shall stop instantly and remain in the stopped position; from the stopped position, the door may then be operated in either direction.

Exterior control stations shall be full guarded, momentary contact, three button, standard duty, surface mounted, weatherproof NEMA ICS 6, Type 4 enclosures, key operated, with the same operating function as specified herein for interior remote control stations.

#### 2.10.10 Speed Reduction Units

Speed reduction units shall be one of the following:

V-belt drive from the sheave on the motor to the sheave on the clutch shaft; additional reduction by chain and sprocket drive. Drive shafts shall rotate on ball bearing assemblies that are integral with the unit.

Hardened steel worm and bronze worm gear assembly running in oil or grease and encased in a sealed casing, coupled to the motor through a flexible coupling; additional reduction by chain and sprocket drive. Drive shafts shall rotate on ball or roller bearing assemblies that are integral with the unit.

Minimum ratings of speed reduction units shall be in accordance with AGMA provisions for class of service.

Worm gears shall be ground to provide an accurate thread form; all other types of gearing shall have machined teeth. All gears shall be surface hardened.

Bearings shall be the antifriction type equipped with oil seals.

#### 2.10.11 V-Belt Drives

Sheave pitch diameters and belt tensions of V-belt drives shall be in accordance with the recommendations of the belt manufacturer and the MPTA. Drives shall be matched combinations rated by the manufacturer at not less than 1.5 times the drive motor horsepower. wattage rating.

V-belt shall be oil and heat resistant and shall conform to FS ZZ-B-190, RMA IP-20, and RMA IP-22.

Sheaves shall be fabricated from cast iron or zinc alloy die cast metal conforming to ASTM B 86, or bar steel, single groove or two groove design, center machine bored, with standard keyway and hollow head setscrews.

#### 2.10.12 Chain Drives

Roller chains shall be power transmission series steel roller type conforming to ASME B29.1M, with a minimum safety factor of 10 times the design load.

Roller chain side bars, rollers, pins, and bushings shall be heat treated or otherwise hardened.

Chain sprockets shall be high carbon steel with machine cut hardened teeth, finished bore and keyway, and hollow head setscrews.

#### 2.10.13 Brakes

Brakes shall be internally expanding 360-degree shoe brakes or shoe-and-drum brakes, solenoid operated, and electrically interlocked to the control circuit to set automatically when power is interrupted.

#### 2.10.14 Clutches

Clutches shall be the 4-inch 100 millimeter diameter, multiple face, externally adjustable friction type or adjustable centrifugal type.

### PART 3 EXECUTION

#### 3.1 STEEL FRAMING

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**NOTE: Delete the paragraph heading and the following paragraph if vertical door track is not attached to steel members at door openings.**

Steel framing and steel shapes to receive door tracks at door openings should be as specified in Section 05500 METAL FABRICATION. Jamb angles should be not less than 3-1/2 by 3-1/2 inches by 1/4-inch 90 by 90 by 6 millimeter thick.

\*\*\*\*\*

Previously erected steel framing at jambs and heads of door openings shall be plumb, true, and securely anchored in place. Vertical members shall be plumb, with a deviation of not more than 1/16 inch in 20 feet 1.6 millimeter in 600 millimeter. Inside faces of steel jambs shall extend to the ceiling or to the minimum headroom height of doors.

#### 3.2 INSTALLATION

Doors, track, and operating equipment shall be installed complete with specified preparatory framing, jamb and head mold stops, anchors, inserts, hangers, and equipment supports in accordance with approved drawings, manufacturer's printed instructions, and as specified herein.

Vertical track assemblies shall be fastened to steel or wood framing with 1/2-inch M14 galvanized machine bolts or lag screws not more than 24 inches

600 millimeter on center and erected plumb and true to a vertical alignment of not more than 1/16 inch 1.6 millimeter deviation in 20 feet 6100 millimeter.

Horizontal tracks shall be hung from the structural ceiling frame by angle or channel hangers and shall be welded and bolt fastened in place with sway bracing, diagonal bracing, and reinforcing as required for a rigid installation.

Upon completion of the installation, doors shall be weathertight, free from warp, twist, or distortion and lubricated, tested, and adjusted to operate freely.

### 3.3 ACCEPTANCE PROVISIONS

Operating instructions for Overhead Door Systems Maintenance shall include operation and maintenance instructions.

Contractor shall submit [6] [\_\_\_\_\_] copies of the Operation and Maintenance Manuals 30 calendar days prior to testing components of the Overhead Door System. Data shall be updated and resubmitted for final approval no later than 30 calendar days prior to contract completion.

Operation and maintenance manuals shall be consistent with manufacturer's standard brochures, schematics, printed instructions, general operating procedures, and safety precautions. Test data shall be legible and of good quality. Light-sensitive reproduction techniques are acceptable provided finished pages are clear, legible, and not subject to fading. Pages for vendor data and manuals shall have 3/8-inch 10 millimeter holes and be bound in 3-ring, loose-leaf binders. Data shall be organized by separate index and tabbed sheets, in a loose-leaf binder. Binder shall lie flat with printed sheets that are easy to read. Caution and warning indications shall be clearly labeled.

Contractor shall provide classroom and field instructions in operation and maintenance of systems equipment where required by the technical provisions. These services shall be directed by the Contractor, using the manufacturer's factory trained personnel or qualified representatives. Contracting Officer shall be given 7 calendar days written notice of scheduled instructional services. Instructional materials belonging to the manufacturer or vendor; e.g., lists, static exhibits, visual aids, shall be made available to the Contracting Officer.

Doors, tracks, and operating equipment will be examined and tested by the Government for general operation, for operation against the specified wind pressure, and for resistance to weather.

Doors that fail to meet the required tests shall be adjusted and tested. Doors that have been adjusted and which fail subsequent tests shall be removed and replaced with new doors. New doors shall be tested and adjusted at no additional cost to the Government.

Not more than 90 calendar days after completion and acceptance of the project, the Contractor shall examine, lubricate, test, and re-adjust doors



as required for proper operation.

-- End of Section --